DEVELOPMENT OF TOOLS TO MEASURE PRESCRIPTION QUALITY AND MEDICATION COMPLIANCE IN ADULT HYPERTENSIVE PATIENTS

By

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DEFINITION OF TERMS

Term	Definition
Adverse drug reaction	Unwanted or harmful reaction experienced following the administration of a drug or combination of drugs and is suspected to be related to the drug. The reaction may be a known side effect of the drug or it may be a new previously unrecognized adverse drug reaction.
Adverse event	Any undesirable experience that has happened to the patient while taking a drug but may or may not be related to the drug. Adverse event encompass adverse drug reaction but may also include cases where no association has been or can be made between drug administration and the adverse event experienced.
Appropriate drug therapy	Requires that patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements for an adequate period of time, and the lowest cost to them and their community (WHO, Santoso)
Ceiling effects	Percentage of prescriptions with maximum possible score
Drug-related problem	Event or circumstance that actually or potentially interferes with desired health outcomes.
Floor effects	Percentage of prescriptions with minimum possible score
Hypertension	Systolic blood pressure of 140mmHg or greater and/or diastolic blood pressure of 90 mmHg or greater, or the taking of antihypertensive medication.
Medical error	Any mistake made in diagnosis or treatment as defined by the Institute of Medicine's (IOM). One category of medical errors is medication errors, defined as mistakes made in prescribing, transcribing, dispensing, administering, or monitoring medication.
Medication error	Any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient or consumer.

Term	Definition
Non-compliance	Degree to which the patient does not conform to medical advice regarding lifestyle, dietary changes, keeping follow-up appointments and taking prescribed treatment. In the treatment of hypertension, a minimum compliance of 80% is generally needed to achieve an adequate reduction in blood pressure
Non-compliance to follow up	Failure to turn up for scheduled appointment date and no arrangement is made for another appointment within a week
Pill-count compliance	A ratio of 0.8 (80%) to 1.2 (120%) will be used as the criteria for adequate medication compliance
Polypharmacy	Administration of more medications than are clinically indicated.
Pharmaceutical care	Responsible provision of drug therapy for the purpose of achieving definite outcomes which improve patient's quality of life (Hepler & Strand, 1990)
Psychosocial factors	Group of factors comprising psychological, emotional, attitude, knowledge, risk-taking behavior and belief, and social aspects of life.

LISTS OF ABBREVIATIONS

ACEI	Angiotensin-converting enzyme inhibitor
ADR	Adverse drug reaction
ANCOVA	Adjusted mean using analysis of covariance
ANOVA	One way analysis of variance
ARB	Angiotensin II receptor blocker
BMI	Body mass index
BP	Blood pressure
CCB	Calcium channel blocker
COPD	Chronic obstructive pulmonary disease
CPOE	Computerized Prescriber-Order-Entry
DUE	Drug utilization evaluation
DUR	Drug utilization review
EFA	Exploratory Factor Analysis
HBM	Health Belief Model
HOT	Hypertension Optimal Treatment
HRQOL-20	Health-Related Quality of Life-20
HUKM	Hospital Universiti Kebangsaan Malaysia
HUSM	Hospital Universiti Sains Malaysia
IOM	The Institute of Medicine
IQR	Interquartile range

MAI	Medication Appropriateness Index
Mal-HRQOL-20	Malay version of the Health-Related Quality of Life-20
MCQ	Medication Compliance Questionnaire
MEMS	Medication Event Monitoring System
MRC	Medical Research Council's
NHP	Nottingham Health Profile
NSAID	Non-steroidal anti-inflammatory drug
OR	Odd ratio
PCA	Principal components analysis
PSHC	Patient Satisfaction with Health Care Questionnaire
PQ	Psychosocial Questionnaire
PQI	Prescription Quality Index
P&T committees	Pharmacy and therapeutic committees
QOL	Quality of life
RA	Reliability analysis
SCOPE	Study on Cognitive and Prognosis in the Elderly
SD	Standard deviation
SF-36	Medical Outcomes Study 36-Item Short Form Health Survey
SHEP	Systolic Hypertension in the Elderly Program
Syst-Eur Trial	Systolic Hypertension in Europe Trial
WHO	World Health Organization

LISTS OF PUBLICATIONS AND PRESENTATIONS

1. PUBLICATIONS

1.1 Hassan, N. B., Hasanah. C.I., Naing, L. & Rahman, A. R. Comparison of quality of life in compliant and noncompliant hypertensive patients. PO4-153 The 21st Scientific Meeting of the International Society of Hypertension, 15th - 19th October, 2006, Fukuoka, Japan (Abstract)

1.2 Hassan, N. B., Hasanah. C.I., Naing, L. & Rahman, A. R. (2007). Comparison of quality of life in compliant and noncompliant hypertensive patients. Malaysian Journal of Public Health Medicine, **7(Suppl 3),** P4, 41.

1.3 Hassan, N. B., Hasanah, C.'I., Foong, K., Naing, L., Awang, R., Ismail, S. B., Ishak, A., Yaacob, L. H., Harmy, M. Y., Daud, A. H., Shaharom, M. H., Conroy, R. & Rahman, A. R. (2006). Identification of psychosocial factors of noncompliance in hypertensive patients. *J Hum Hypertens,* **20**(1), 23-9.

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15th – 19th February 2004 (Abstract)

2 ORAL PRESENTATIONS

2.1 Quality of life and Medication Compliance
Persidangan Farmasi Negeri Kelantan
Hotel Sutera Inn, Kota Bharu, Kelantan, Malaysia
1th December 2007

2.2 Hypertension and Atherothrombosis,
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Sudara Beach Resort, Tok Bali, Kelantan, Malaysia.
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2.3 Identification of the Psychosocial Factors of Non-Compliance in Hypertensive Patients Undergoing Pharmacotherapy
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16th -18th October 2004

2.4 To Identify the Psychosocial Factors of Non-Compliance in Hypertensive Patients Undergoing Pharmacotherapy
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19th – 21st September 2003

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Kota Kinabalu, Sabah, Malaysia
26th – 27th April 2003

3 POSTER PRESENTATION

3.1 **Norul Badriah Hassan**, Hasanah Che Ismail, Lin Naing, Ronan Conroy & Abdul Rashid Abdul Rahman
Factors Associated with Prescription Quality in Hypertension
22nd Scientific Meeting of the International Society of Hypertension, Berlin, Germany
16th June 2008

3.2 **Hassan, N.B.,** Che Ismail, H,, Naing, L., Conroy, R., & Abdul Rahman, A.R.
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3.7 **Hassan, N. B.,** Abd. Rahman, A.R., Shaharom, M.H., Yusoff, K., & Che Ismail, H, Validation of Patient Satisfaction with Health Care Questionnaire
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Malaysian Society of Hypertension, 1st Scientific Meeting
Prince Hotel, Kuala Lumpur, Malaysia.
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PENGHASILAN KAEDAH-KAEDAH UNTUK MENGUKUR KUALITI PRESKRIPSI DAN KOMPLIAN TERHADAP PENGUBATAN DALAM PESAKIT DARAH TINGGI DEWASA

ABSTRAK

Objektif tesis ini ialah untuk menghasil dan mengesahkan kesahihan kaedah-kaedah baru untuk pengukuran kualiti preskripsi, komplian terhadap pengubatan, dan faktor-faktor psikososial yang mempengaruhi ketidak komplian pesakit terhadap pengubatan. Kaedah ini akan digunakan sebagai pengukur yang berkualiti dari perspektif pegawai perubatan, pegawai farmasi dan pesakit.

Indeks Preskripsi Berkualiti (PQI) telah dihasilkan berdasarkan hasil tiga tinjauan berasingan dan kajian pilot telah dijalankan dalam 120 pesakit kronik dan 240 pesakit darah tinggi. Soal-Selidik Komplian Terhadap Pengubatan (MCQ), Soal-Selidik Kepuasan Pesakit Dalam Penjagaan Kesihatan (PSHC), dan Soal-Selidik Psikososial (PQ) telah dihasilkan dan diukur kesahihannya dalam dua kajian pilot 60 pesakit darah tinggi yang berasingan. Seterusnya, kajian kohort telah dijalankan selama 6 bulan pada pesakit darah tinggi. Preskripsi ubat telah dinilai secara retrospektif dan soal-selidik diisi sendiri oleh pesakit. Hasil kajian telah dianalisa menggunakan SPSS versi 12.0.1.

Indeks Preskripsi Berkualiti mempamerkan *Cronbach's alpha* bernilai 0.60 dan julat *intra-rater* dan *inter-rater* ialah dari 0.28 hingga 0.97 (purata: 0.76) dan 0.22 hingga 0.82 (purata: 0.52) secara berturut. Nilai *Cronbach's alpha* untuk Soal-Selidik Komplian Terhadap Pengubatan ialah 0.67 dan 0.84 dengan nilai *test-retest* dari 0.78 hingga 0.93. Untuk Soal-Selidik Kepuasan Pesakit Dalam Penjagaan Kesihatan, nilai *Cronbach's alpha* ialah dari 0.76 hingga 0.91 dan *test-retest* dari 0.54 hingga 0.70. Nilai *Cronbach's alpha* untuk Soal-Selidik Psikososial ialah dari 0.42 hingga 0.87 dan *test-retest* dari 0.53 hingga 0.77.

Seramai 184 pesakit telah menyempurnakan kajian dengan tujuh pesakit tidak dapat dikesan semasa lawatan susulan. Pendidikan tertiari (OR=0.11; 95% CI:0.03 to 0.43; p=0.001), bilangan ubat (OR=1.96; 95% CI:1.46 to 2.64; p<0.001), tempoh penyakit darah tinggi (OR=1.01; 95% CI:1.00 to 1.01; p=0.009), dan gaya hidup pesakit (OR=0.96; 95% CI:0.93 to 0.99; p=0.004) telah dikenalpasti sebagai faktor-faktor penting dan bebas yang mempengaruhi kualiti preskripsi.

Pendidikan tertiari pesakit (OR=0.22; 95% CI:0.06 to 0.86; p=0.029), kepuasan pesakit dalam penjagaan kesihatan secara keseluruhan (OR=0.95; 95% CI:0.91 to 0.98; p=0.006), halangan pengubatan (regim yang kompleks, kos dan keberkesanan) (OR=0.92; 95% CI:0.86 to 0.97; p=0.006), dan halangan logistik dan kenderaan (OR=1.03; 95% CI:1.01 to 1.05; p=0.017) telah dikenalpasti sebagai faktor-faktor bebas dan penting yang mempengaruhi ketidak komplian terhadap pengubatan.

Sebagai kesimpulan, tesis ini telah menghasilkan empat kaedah baru yang sahih dengan ciri-ciri psikometrik yang sederhana dan baik untuk digunakan dalam penjagaan pesakit dan juga kajian klinikal atau epidemiologi. Faktor-faktor yang berkaitan dengan kualiti preskripsi yang baik ialah pendidikan yang lebih tinggi, bilangan ubat yang sedikit, tempoh penyakit darah tinggi yang lebih pendek dan gaya hidup yang lebih sihat. Faktor-faktor psikososial yang mempengaruhi ketidak komplian pesakit terhadap pengubatan ialah pendidikan pesakit, kepuasan pesakit, halangan pengubatan, dan halangan logistik dan kenderaan. Kajian selanjutnya dalam penyakit dan populasi yang berlainan sangat dicadangkan.

DEVELOPMENT OF TOOLS TO MEASURE PRESCRIPTION QUALITY AND MEDICATION COMPLIANCE IN ADULT HYPERTENSIVE PATIENTS

ABSTRACT

The objectives of this thesis were to develop and validate new tools to measure prescription quality, medication compliance, and psychosocial factors contributing to non-compliance. These tools are to be used as quality measurement from the perspectives of clinicians, pharmacists and patients.

The Prescription Quality Index (PQI) was developed based on three separate surveys and piloted in 120 patients with chronic illnesses and 240 patients with hypertension. The Medication Compliance Questionnaire (MCQ), Patient Satisfaction with Health Care Questionnaire (PSHC) and Psychosocial Questionnaire (PQ) were developed and validated in two separate pilot studies of 60 hypertensive patients each. A cohort study was then conducted for six months in patients with hypertension. Prescriptions were rated retrospectively and questionnaires were self-administered by patients. Results were analyzed using SPSS version 12.0.1.

The PQI displayed Cronbach's alpha of 0.60 and range of intra-rater and inter-rater reliability were 0.28 to 0.97 (average: 0.76) and 0.22 to 0.82 (average: 0.52) respectively. The Cronbach's alpha for the MCQ were 0.67 and 0.84 with test-retest values of 0.78 and 0.93. For the PSHC, the Cronbach's alpha ranged from 0.76 to 0.91 and test-retest ranged from 0.54 to 0.70. The Cronbach's alpha for the PQ ranged from 0.42 to 0.87 with test-retest value of 0.53 to 0.77.

A total of 184 patients completed the study with seven patients lost to follow-up. Tertiary education (OR=0.11; 95% CI:0.03 to 0.43; p=0.001), number of drugs (OR=1.96; 95% CI:1.46 to 2.64; p<0.001), duration of hypertension (OR=1.01; 95% CI:1.00 to 1.01; p=0.009), and patients' lifestyle (OR=0.96; 95% CI:0.93 to 0.99; p=0.004) have been identified as significant and independent factors associated with prescription quality.

Patients' tertiary education (OR=0.22; 95% CI:0.06 to 0.86; p=0.029), overall satisfaction with health care (OR=0.95; 95% CI:0.91 to 0.98; p=0.006), medication barrier (complex regime, cost, and effectiveness) (OR=0.92; 95% CI:0.86 to 0.97; p=0.006), and logistic and transportation barrier (OR=1.03; 95% CI:1.01 to 1.05; p=0.017), were identified as independent and significant factors associated with medication non-compliance.

In conclusion, this thesis has generated four new tools with moderate to good psychometric properties to be used in patient care and for clinical or epidemiological studies. Factors associated with good prescription quality were higher education, lesser number of drugs, shorter duration of hypertension and healthier lifestyle. Psychosocial predictors of medication non-compliance were patient education, patient satisfaction, medication barrier, and logistic and transportation barrier. Future studies in other disease states and populations are highly recommended.

CHAPTER 1. INTRODUCTION

1.1 Introduction

Quality is one of the most predominant performance indicators in the services that an organization provides to its customers. In health care, quality is provided by a complex blend of multidisciplinary, technological and human resources. The challenge lies in providing good quality health care to increasingly high expectations of the populations, while ensuring safety and affordable health costs to everyone. Maintaining and improving quality standards are central to professionalism in health care.

Variations in health care quality are far greater than most people realise. Kerr, *et al.*, (2004) studied how effectively care is delivered in 12 metropolitan areas in United States and found that improvement are needed in overall quality and dimensions of preventive, acute and chronic care in all these communities. In the community with the highest overall quality score, less than 60% of effective care was delivered on average. This result was consistent with the findings from another study by McGlynn, *et al.*, (2003).

Most of the quality theories are applicable to health care. Quality can be defined and measured (Katz & Green, 1997). In addition, quality is dynamic and develops from continual improvement. It involves a competitive edge and a primary source of cost reduction. However, cost-reductions do not usually lead to improved quality and usually do not produce long-term lower costs. Quality has to do with doing the "right" things

right the first time and efforts should be focussed toward achieving zero defects or deficits. Furthermore, quality also relates to outcomes, preferably improved clinical outcomes and is the responsibility for all persons involved. Quality and cost are linked and improvement in quality may be the key to control expenses and generate incomes. However, the process of quality improvement itself can be a drain if not controlled and/or if the organization is improving the wrong processes. Quality and performance are synonymous.

The growing interest in the quality of health care, cost-effectiveness, and patients' outcomes has stimulated the acceptance of the concepts of rational and evidence-based practices. There has been much emphasis on the need to improve clinical effectiveness by promoting rational and evidence-based medicine. Health practitioners are increasingly being called upon to account for their own practices and required to identify, appraise and implement evidence relevant to their work. Research findings need to be critically appraised in the light of detailed knowledge of local circumstances and practices.

With the explosion of information technology and scientific knowledge, health care practitioners might not be able to keep up with the sheer quantity of published articles. In addition, they might not have the skills to distinguish between rigorous and useful research, and poor and unreliable findings (Trindler, 2001). Many clinical studies are methodologically weak, not based on the gold standard of well conducted randomised controlled trial designs, or inapplicable within clinical or practice situations (Shelton, *et al.,* 1997). Practitioners might use interventions which are ineffective or even harmful

(Hennessy, *et al.,* 2003). Furthermore, adoption of effective interventions might be limited or slowed. Therefore, rational and evidence-based practice approach offered a tailor-made solution to these problems.

Despite the campaigns by professional bodies and government departments to promote rational and evidence-based practice, the rate of change is slow. It is the responsibility of all health care personnel to maintain rational and evidence-based practices in their fields so as to improve quality in health care. Consequently, outcomes of quality health care such as prescription quality will also improve.

1.2 Definition

Quality in health care is difficult to define and so it is not surprising that many definitions and dimensions of quality exist (Katz & Green, 1997). Initially, definitions of quality in health care tended to focus on the technical aspects of quality. Donabedian' approach to quality relate to structure, process, and outcomes. The author suggested three different definitions of quality based upon the notion of the benefits versus the harm of care (Donabedian, 1982). The absolutist definition of quality considers the possibility of benefit and harm to health as valued by practitioner, with no intention for monetary cost. The individualized definition of quality takes into account the patients' expectations of benefit/harm and other undesired consequences (e.g. monetary cost to client). Finally the social definition includes the cost of care and the benefit/harm and distribution of health care as valued by the population in general. He sees the balance of these benefits and

harms as the essential care of quality. Wyszewianski, *et al.*, (1987) definition includes accuracy of diagnosis and the appropriateness and efficacy of treatment rendered.

The National Association of Quality Assurance Professionals (1996) defines quality as levels of excellence produced and documented in the process of patient care, based on the best knowledge available and achievable at a particular facility. This practical definition recognises the dynamic nature of information and acknowledges the limits of our scientific and technical knowledge and achievements. Furthermore, it suggests the responsibility of professionals for using the best information available and striving to increase that knowledge.

Definition of quality health care and its measures vary depending on whose perspective is being considered. From the providers' perspectives, quality of care is defined as the ability of available healthcare services to produce the greatest improvement that science can achieve. However, clients' perspectives of quality involve accessibility to care; interpersonal processes, such as communication, friendliness, explanations, and sensitivity to clients' needs, and outcomes. Degree of improvement in health status and satisfaction with health services are two ways to measure outcomes. While definitions are important to help people to understand the concept of quality, it is the integrations and applications of these quality concepts that are of prime importance in health care.

1.3 Rational and evidence-based practice

The preoccupation with quality and rationality has dominated healthcare management during the last two decades. Rational prescribing improves health quality by improving several aspects of drug utilisation process, such as the prescribing process. It requires physicians to make an accurate diagnosis, understand the pathophysiology of the disease or condition, know the pharmacology of the prescribed drugs, and consider the many other elements of appropriate medication use, and monitor patient outcomes (Hanlon, *et al.,* 1992; Chaudhury & Tripathi, 1997).

The Conference of Experts on the Rational Use of Drugs, convened by the World Health Organizations (WHO) in Nairobi in 1985 defined that rational use of drugs requires that appropriate drug be prescribed, available at the right time, at affordable price, dispensed correctly, taken at the right dose at the right intervals, and for the right length of time. The appropriate drug must be effective, and of acceptable quality and safety. (Santoso, 1996; Chaudhury & Tripathi, 1997; WHO, 2002). The terms "rational" and "appropriate" use of drugs will be used interchangeably throughout this thesis.

Decisions in health care management and clinical practice should also be based on evidence (Dranitsaris, 2001; Peat, *et al.*, 2002; Leape, *et al.,* 2002). Evidence-based medicine is defined as the systematic application of the best available evidence to the evaluation of options and decisions in clinical practice, management and policy-making (Sultz & Young, 2001). It is an approach to decision making in which the clinician uses

the best evidence available, in consultation with the patient, to decide upon the best option which suits that patient (Sackett, *et al.,* 1996).

Evidence-based approach relies on sound methodological studies such as randomised controlled trials to make informed clinical decisions. Five steps in evidence-based decision making are: asking the right questions, finding the relevant evidence, appraising the evidence to select the best, decision making based on the evidence, and storing the evidence for future use (Gray, 2001). It is the responsibility of organisation management, medical, pharmacy, other health care practitioners and researches to keep up to date with the latest evidence in their fields and change their practices accordingly to maintain and improve quality in health care.

To facilitate rational and evidence-based prescribing, evaluation of factors such as physicians and patient characteristics and the efficacy and cost of individual drugs are required. This will involve a more sophisticated integration of existing information sources and the adoption of uniform guidelines. Any successful attempt to correct inappropriate prescribing must bring together people with skills in drug database and drug information systems such as clinical pharmacists and pharmacologists.

1.4 Factors affecting quality in health care

Several factors may affect quality in health care (Figure 1.1). Prescribers play major roles and responsibilities in the management of patients' health care. Pharmacists contribute to health care with their pharmaceutical care services. These include promoting rational and effective use of drugs, drug information and education, drug distribution system, drug therapy monitoring and patients counselling. Patients may also contribute to quality health care with their knowledge, attitudes, beliefs, expectations, and compliance behaviour. Health regulators and health administrators play important roles in training their entire health care staffs to change their old ways and providing new technology. Health administrators have access to their current system to find out where and when problems occur, and decide which area need to change.

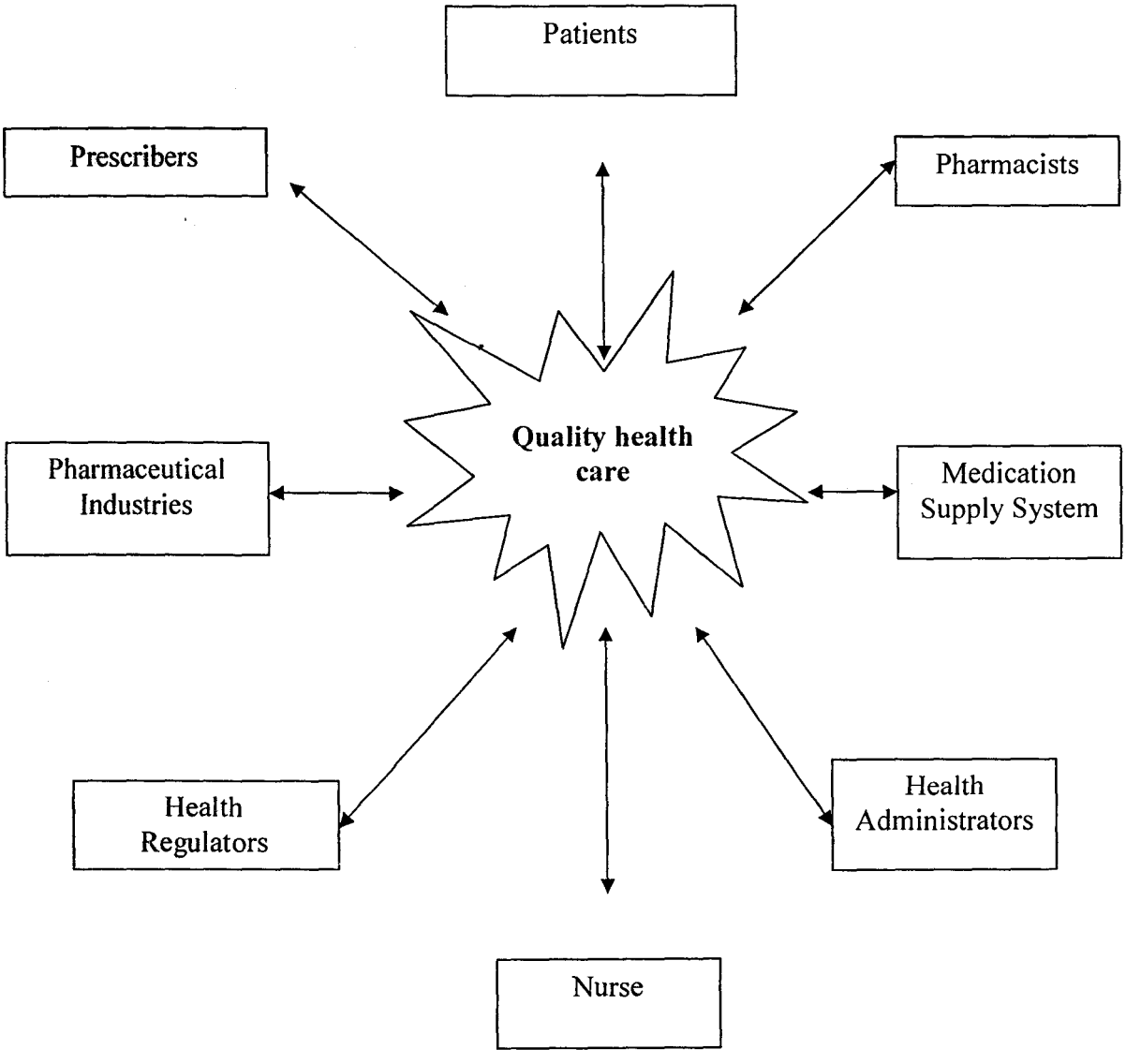

Figure 1.1 Factors affecting the quality of health care

1.5 Quality in prescribing medications

Medication therapy can improve quality health care through cure or prevention of disease, reduction or elimination of symptoms or arresting or slowing of a disease process. When used appropriately, medication therapy is often more effective than other kinds of treatment. However, inappropriate use can compromise patient safety, deplete health care resources, morbidity, and mortality.

Medications have to be appropriately prescribed and dispensed before patients can optimise their benefits. However, several studies have shown that prescribing practices are frequently inappropriate, illogical and even dangerous (Coste & Venot, 1999; Lagerlov, *et al.,* 2001; Ni, *et al.,* 2002). Medical uncertainty, perception, social background, belief, attitude and patients expectations may cause variability in prescribing practices. Prescription is one of the direct outcomes of drug prescribing. Consequently, inappropriate prescribing practice also resulted in poor in prescription quality.

1.6 Effects of poor prescription quality in health care

It has been estimated that more than 50% of 1.8 billion prescriptions were used incorrectly. Drug related problems, including adverse drug reactions, accounted for nearly 10% of all hospital admissions and up to 140,000 deaths annually in the United States. The complexity of drug protocols and subsequent miscalculations, necessity for speed of actions in emergency situations, marketing of multiple concentrations of drug

products and availability of highly concentrated drug products on nursing units appear to have contributed to fatal medication errors (Philips, *et al.*, 2001).

Prescription errors may result from a single or multiple breakdowns in a system's continuum of diagnosing an ailment, planning a therapeutic regimen, prescribing and dispensing drugs and administering the drugs. Medication errors occur in 3-6.9% of inpatients with a rate reported to be between 3.23-16.9% for inpatient drug order. For outpatient prescriptions, 3.2% contain major error (Bond & Raehl, 2001). Fatal medication errors accounted for approximately 10% of medication errors and were most frequently the result of improper dosing of the intended drug and administration of an incorrect drug (Philips, *et al.*, 2001). Increased awareness and improved understanding of the nature of the errors will be useful in the design of error preventive initiatives.

1.7 Hypertension

Hypertension is a major risk factor for developing coronary heart disease, stroke and congestive heart failure. The primary goal in treating hypertension is to achieve optimal blood pressure (BP) levels, thereby reducing the risks of cardiovascular morbidity and mortality (Harvey & Woodward, 2001; Neutel, 2002). However, despite broad and expanding choices in anti-hypertensive treatments, less than one third of hypertensive adults have their BP under control in the United States (Mancia, *et al.*, 2003). In Malaysia, Lim & Morad, (2004) in a population based-study reported that the prevalence of hypertension among adults aged 30 years and above was 33%. Among the

hypertensives, 33% were aware of their hypertension, 23% were treated and only 6% had controlled BP.

Asch, *et al.*, (2001) reported that out of 234 women with average BP of 140/90 mm Hg or more, only 64% received recommended care. Most patients did not receive adequate initial history, physical examination, or laboratory tests. Only 37% of hypertensive women with persistent BP elevations of more than 160/90 mm Hg had changes in therapy or lifestyle recommended.

The benefits of optimum BP control have been demonstrated to reduce the risks of major cardiovascular events (Hansson, *et al.*, 1998). The Hypertension Optimal Treatment (HOT) trial divided patients into target groups of diastolic BP>90, 86-90, 81-85, and <80 mm Hg. The Psychosocial General Well Being Index Scale was used to measure quality of life (QOL). The researchers found that there was a proportional improvement in QOL when BP was lowered particularly with cardiac symptoms and headache. The risk for stroke, coronary heart disease, and other major cardiovascular events were lowest in patients assigned the most intensive BP lowering strategy compared to those with less intensive BP lowering strategy.

Hypertension is selected as an appropriate disease model for this study. The silent nature of hypertension often leads to poor compliance and consequently, treatment failure. Unlike other chronic diseases, the consequences of non-compliance in hypertension are relatively delayed. In addition, Bloom, (2001) suggested that hypertension is the disease

in which compliance and persistence have been best studied. Furthermore, hypertension has well defined and established prescribing guidelines worldwide and locally.

1.7.1 Definition and classification

Hypertension was defined as systolic BP ≥ 140 mm Hg and/or diastolic BP ≥ 90 mm Hg or use of antihypertensive medication (Malaysian clinical practice guidelines on the management of hypertension, 2002; Chobanian, *et al.,* 2003). The term hypertension refers to persistent elevation of BP as recorded several times on different days. Isolated office ("white-coat") hypertension is a condition noted in patients whose BP is consistently elevated in the physician's clinic but normal at other times. Isolated systolic hypertension is defined as systolic BP of ≥ 140 mm Hg and diastolic BP of ≤ 90 mm Hg.

The classification of hypertension is important for physicians must make treatment decisions based on the measured BP and the patients' associated risk factors. Table 1 classified BP for adults aged 18 years. Patients with pre-hypertension are at increased risk for progression to hypertension.

Table 1.1 Classification and management of blood pressure for adults*

BP Classification	SBP mm Hg	DBP mm Hg	Lifestyle Modification	Initial Drug Therapy	
				Without Compelling Indication	With Compelling Indications (See Table 1.2)
Normal	< 120	and < 80	Encourage	No antihypertensive drug indicated	Drug(s) for compelling indications#
Pre-hypertension	120-139	or 80-89	Yes		
Stage I Hypertension	140-159	or 90-99	Yes	Thiazide-type diuretics for most. May consider ACEI or ARB or BB or CCB	Drug(s) for the compelling indications# Other antihypertensive drugs (diuretics, ACEI, ARB, BB, CCB) as needed
Stage II Hypertension	≥ 160	or ≥ 120	Yes	Two drug combination for most § (Usually thiazide-type diuretic and ACEI or ARB or BB or CCB)	

DBP Diastolic blood pressure.

SBP Systolic blood pressure.

* Treatment determined by highest BP category.

§ Initially combined therapy should be used cautiously in those at risk for orthostatic hypotension.

Treat patients with chronic kidney disease or diabetes to BP goal of < 130/80 mm Hg.

Drug abbreviations: ACEI, angiotensin converting enzyme inhibitor
ARB, Angiotensin receptor blocker
CCB, Calcium channel blocker
BB, Beta-blocker

Adapted from The Seventh Report of the Joint National Committee (JNCVII) on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, 2003.

1.7.2 Pathogenesis

In essential hypertension, several pathophysiologic mechanisms are involved including sympathetic nervous system regulation, cell membrane defects, and vascular and hormonal factors. Associated physiologic abnormalities and risk factors are environmental and lifestyle factors, genetic factors, renin secretion, sensitivity to salt, insulin resistance, and electrolyte abnormalities (Waeber, 2002). Secondary hypertension is associated with a specific organ defect (usually kidney) or a metabolic or endocrine abnormality.

1.7.3 Diagnosis of hypertension

Diagnosis of hypertension is based on average BP $\geq$ 140/90 mm Hg on three sets of readings at least a week apart. It is well established that elevated systolic BP is an important cardiovascular risk factor. In hypertensive patients with diabetes and renal impairments, the threshold of diagnosis is 130/80 mm Hg. In patients with borderline or variable office BP measurements, consider home ambulatory BP measurements, with 135/85 mm Hg as the hypertension threshold (Chobanian, *et al.*, 2003).

Elevated BP is usually an accidental finding discovered during physical examination of asymptomatic patient in most patients with uncomplicated essential hypertension. Blood pressure should be measured correctly and four most common devices used for BP measurement are mercury column sphygmomanometer, aneroid sphygmomanometer,

electronic devices, and automated ambulatory BP devices. However, mercury column sphygmomanometer remains as the gold standard for BP measurement.

1.7.4 Management of hypertension

The concept of optimum efficacy with lowest side effects provides the rationale for recent hypertension treatment guidelines. Ideally, the drug should be efficacious, free from side effects, able to prevent all the complications of hypertension, easy to use and affordable. Treatment should be individualised. However, the choice of drugs is determined by the presence of concomitant conditions as well as psychosocial and economic factors (Malaysian clinical practice guidelines on the management of hypertension, 2002; Chobanian, *et al.*, 2003).

Non-pharmacologic treatment should be advised for those with pre-hypertension stage (Table 1.1, 1.2). Lifestyle measures include weight reduction, stress reduction, smoking cessation, reduction or avoidance of alcohol consumption, reduction in salt intake, reduction in fat and cholesterol intake, and increased physical activity (Harvey & Woodward, 2001). Dietary intakes with fish oil, potassium, calcium, magnesium and fibre has limited or unproven efficacy (Malaysian clinical practice guidelines on the management of hypertension, 2002).

For stage I hypertension, thiazide diuretics are recommended for most cases. A period of 3 to 6 months of observation is recommended unless target organ involvement is already

evident. With monotherapy, a reduction of up to 10/5 mm Hg is expected and adequate BP is achieved in only 40-50% of patients (Neutel, 2002). Combination therapy with small doses of 2 types of antihypertensives and non-pharmacologic approaches should be sufficient to control blood pressure in the majority of patients not controlled with monotherapy.

Stage II hypertension usually requires a two-drug combination. Use of low dosage combination therapy may facilitate maximum efficacy, improve tolerability, improve compliance and reduce side effects (Neutel, 2002; Waeber, 2002). Interest in using fixed-dose combination therapy is increasing, particularly for meeting the more stringent BP goals recommended for hypertensive patients with concurrent medical problems such as diabetes and renal disease. Advantages of combination therapy are: higher response rates, additive effects at lower doses, potential for the individual components to attenuate or cancel compensatory hemodynamic changes induced by single agent therapy, potential to attenuate or cancel adverse reactions induced by single agents (eg. angiotensin converting enzyme inhibitors (ACEI) and diuretic combinations and hypokalemia), and potential to provide beneficial effects on target organ damage through effects unrelated to antihypertensive action. Patient perceived benefits of combination therapy are greater convenience, lower cost, fewer side effects (Frishman, *et al.,* 1994) and better compliance (Schroeder, *et al.,* 2004).

Table 1.2 Guideline basis for compelling indications for individual drug classes

Compelling Indications*	Recommended Drugs					
	Diuretic	BB	ACEI	ARB	CCB	Aldo anta
Heart failure	*	*	*	*		*
Post-myocardial infarction		*	*			*
High coronary disease risk	*	*	*		*	
Diabetes	*	*	*	*	*	
Chronic kidney disease			*	*		
Recurrent stroke prevention	*		*			

* Compelling indications for antihypertensive drugs are based on benefits from outcome studies or existing clinical guidelines; the complelling indication is managed in parallel with the BP

Drug abbreviations: ACEI, Angiotensin converting enzyme inhibitor
ARB, Angiotensin receptor blocker
CCB, Calcium channel blocker
BB, Beta-blocker
Aldo anta, Aldosterone antagonist

Adapted from The Seventh Report of the Joint National Committee (JNCVII) on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, 2003.

Many drugs are available for hypertension treatment (Table 1.2). For patients with essential hypertension without co-morbid conditions or target organ damage, any drugs from the following classes can be used: diuretics, ACEI, angiotensin II receptor blockers (ARB), b-blockers, peripheral α-blockers, and calcium channel blockers (CCB). After up to 6 weeks and BP is still not controlled, dose may be increased, or susbtitute with another class of drug or a second drug may be added (Malaysian clinical practice guidelines on the management of hypertension, 2002).

Thiazide-type diuretics have been the drug of choice for most hypertensive patients, either alone or in combination with other drugs (ACEI, ARB, b-blockers, CCB). Beta-blockers may be preferred initial agents in patients with angina, hypertrophic cardiomyopathy, hyperdynamic circulation, heart failure, diabetes, postmyocardial infarction, hypertension associated with cyclosporin (especially labetalol), and vascular headaches. On the other hand, beta-blockade is relatively or absolutely contraindicated in patients with bradycardia, heart block, peripheral vascular disease, sick-sinus syndrome, or asthma/chronic obstructive pulmonary disease (COPD).

Angiotensin converting enzyme inhibitors have proven benefit for the treatment of hypertension with congestive heart failure, left ventricular dysfunction secondary to myocardial infarction, renal disease, and diabetes mellitus with proteinuria. Calcium channel blockers may be useful in patients with coronary heart disease. Furthermore, CCBs do not have significant adverse metabolic effects or compromise diabetic control or aggravate diabetic complications.

Despite the various and expanding choices of antihypertensive drugs, adequate control of BP are still unsatisfactory (Mancia, *et al.,* 2003; Lim & Morad, 2004). There are multiple reasons that contribute to inadequate BP control. The most important ones include patient non-compliance, reluctance of physicians to titrate antihypertensive medications, difficulty in achieving BP control with monotherapy, and lower goals for BP control (Neutel, 2002).

1.8 Background problems

The dynamic changes in health care practice and high rate of medication error call for new approaches to address the multi-dimensional and complex natures of quality health care. In 1999, The Institute of Medicine (IOM) examined available information about errors in medical care and concluded that 44,000-98,000 Americans died each year from medical mistakes. Medication errors represented the largest single cause of errors in the hospital setting, accounting for more than 7,000 deaths annually. The problems are so huge that medication errors could be within the top 10 causes of death in the United States (Leape, *et al.,* 2002). The mistakes in medical care raised a substantial public concern and growing professional awareness with health care quality.

The complex nature of medication error and factors contributing to poor prescribing quality may vary from country to country and its degree may change over time. Furthermore, despite the availability of abundant quality measures in health care, none is

specifically designed to measure the quality of prescriptions in clinical practice especially in patients with chronic diseases.

1.9 Why the study is needed

Many studies raise serious questions about the prescribing appropriateness and prescription quality. Maintaining the current processes is clearly inadequate and systematic approaches to evaluate possible solutions by measuring structure, process and outcomes of patient care are needed. Evaluation of specific health related factors of quality such as prescribing quality, patients' characteristics, and patients' related outcomes such as compliance, patient satisfaction and QOL are certainly required. In addition, identification of factors contributing to these quality outcomes should be performed.

One of the great limitations in measuring the quality of prescriptions is the lack of detection method that is sufficiently simple, sensitive and specific to allow systematic use in clinical setting. Several prescribing indicators are available, but they are not specifically designed to address the multiple problems associated with prescription quality. The lapses in quality which are a subset of a deficient therapeutics and prescribing process are not fully detected by the present quality indicators. A valid and reliable tool to decide whether a prescription is of quality is badly needed.

Clinicians, pharmacists and patients differ in their perspectives of quality health care (Law, *et al.*, 2003). To clinicians and pharmacists, quality health care refers to how well they treat patients. In many areas of practice, perspectives of clinicians and pharmacists are influenced by their objectives, training, evidence from their own experience, and 'standard practices' in their teams or organizations. However, patients' perspectives of quality health care are based mainly on their health expectations and needs. It is important to include patient-based measures in the assessments of outcomes in quality because patient's perspectives do not necessarily correlate with objective measures or providers' perspectives.

A study to generate new tools to measure quality outcomes from the perspectives of clinicians, pharmacists and patients is needed. Such a study should develop a new index to measure prescription quality from the perspectives of clinicians and pharmacists. Although patients are capable of evaluating the services provided, they are less capable of evaluating whether appropriate treatments are given for their complaints. The tool should be valid, reliable, practical, useful, applicable to a broad variety of medications and clinical conditions, and will serve as a way of monitoring prescription quality in clinical practice. In addition, it will extend our knowledge on other information related to prescription quality. This will enable quality of prescriptions to be measured, analysed, monitored, and benefits of interventions can be examined for further improvements in patients care.

In this thesis, assessment of quality from the patients' perspectives will be performed using self-administered questionnaires to assess compliance, patient satisfaction and QOL. These measures are primary outcomes from the patients' perspectives. These patient-centred measures are aimed to assess individual's health state or health-related experience. Understanding patients' perspectives of quality and factors affecting these perspectives can help healthcare providers to identify problems, plan and target interventions, and plan preventive programs to improve patient outcomes.

1.10 Conceptual frameworks

Donabedian conceptualization of structure, process, and outcome quality model was used as an approach in this study for index construction and development of patient satisfaction with Health Care Questionnaire. The Donabedian's quality model is selected for this study because it has a broad and long history of applicability. The concepts have been used, expanded, challenged, refined, and proven by the author himself, and by other researchers (Tasso, *et al.,* 2002; Gagnon & Grenier, 2004; Zanni, 2006). According to Donabedian, quality is a measure of organization effectiveness as assessed through quality indicators, and categorised as structure, process and outcome variables Donabedian, *et al.,* 1982). These variables are causally linked, with good structure setting the condition for good process, which leads to good outcomes.

Structure indicator is a quantitative measure that reflects the availability of resources. Structure represents the attributes of the care settings and should be monitored

periodically to confirm that the capacity to provide quality care is present. However, structure is limited in its value of assessing quality of care because its measures are relatively stable and may not be sensitive or specific enough to monitor ongoing activities.

Process is what is done in caring for patients. It is the content of care and measures what happens as care is sought, designed and provided directly to patients. Process may be technical such as diagnosing patient problems, prescribing medications, reviewing prescriptions, dispensing medications, providing information and patient monitoring or can be interpersonal such as empathy, friendliness, concern, and considerate. The process measures appeal to most researchers because they directly measures what the providers are doing. Changes in the process of care will influence the outcome.

Finally, outcome is the effect of the care process on health and well-being of patients and populations. Outcome measures are of major interests to health care providers, policy makers, and patients because they are directly relevant to the goal of care to improve health status. The scope of outcomes has expanded far beyond the traditional measures of mortality and morbidity. In this thesis, outcomes will be measured from the providers' perspectives such as quality of prescriptions, and from the patients' perspectives such as, compliance, patient satisfaction and quality of life.

The most complete quality assessment tool requires measuring all the three categories of variables. However, other factors such as simplicity, practicality, feasibility, manpower,

time limitations, and lack of sufficient resources should also be taken into consideration in developing quality measurement tools.

1.11 Hypotheses

The hypotheses for the studies are:

1.11.1 Hypothesis of Study I

I. Age and number of drugs significantly affect prescription quality in hypertension.

1.11.2 Hypotheses of Study II

I. Emotional states significantly affect compliance in hypertensive patients on pharmacotherapy.

II. There is a significant correlation between quality of prescriptions and compliance.